

including terms having insufficient antecedent basis.

In response, claim 2 is amended to remove insufficient antecedent basis for 'the silver nanoparticles' and 'the fertilizer ingredients' and to provide further limitations. In particular, 'the silver nanoparticles' is amended to 'silver nanoparticles having a particle size of 1 to 100 nm' and 'the fertilizer ingredients' is amended to 'adjuvants one or more selected from a water soluble salt, metallic oxide, non-metallic oxide, which are used at the amount of 0.1 to 20% by weight relative to the titanium dioxide solids'. The amendments are supported by the original specification.

II. Claims 2, 4, 7, 8, 10 and 11 are rejected under 35 U.S.C. §§ 102(a) and 102(e) as being anticipated by Aubay et al. (US 6,905,814, Aubay reference hereinafter).

In response, claims 2, 9 and 11 are amended and claim 12 is added.

Amended claim 2 is compared with Aubay reference.

Claim 2 is as follows:

'A liquid composition for promoting plant growth by increasing the photosynthetic efficiency, which contains titanium dioxide nanoparticles, having a particle size of 3 to 200 nm; and silver nanoparticles having a particle size of 1 to 100 nm; and adjuvants one or more selected from a water soluble salt, metallic oxide, non-metallic oxide, which are used at the amount of 0.1 to 20% by weight relative to the titanium dioxide solids; and a surfactant for dispersion one or more selected from a cationic surfactant, a nonionic surfactant, an anionic surfactant, an amphoteric surfactant, which are used at the amount of 0.1 to 5% by weight relative to the titanium dioxide solids.'

On the other hand, Aubay reference discloses a process for cleaning or disinfecting surfaces exposed to light. The process comprises the step of depositing a film of titanium dioxide on the surfaces with a film-forming dispersion comprising a continuous phase, said titanium dioxide being in the form of elementary particles whose size is less than 100 nm, and whose specific surface area is greater than 150 m²/g, the continuous phase of said

dispersion comprising water or at least one alcohol whose boiling point is less than 120.degree. C., and said dispersion having, when it comprises water, a pH different by at least 1 unit, from the value of the isoelectric point of titanium dioxide in said dispersion, said dispersion further comprising at least one film-forming organic or organosiloxane polymer interacting with the surface of the titanium dioxide particles by electrostatic bonding and selected from the group consisting of: a sulfonated terephthalic oligoester or copolyester, a polyoxyalkylenated polymer which carries anionic functions, a cationic polymer additionally exhibiting bacteriostatic properties, a cationic homopolymer or copolymer derived from at least one cationic monomer comprising an ethylenic unsaturation, optionally in a mixture with at least one nonionic monomer, and an amphoteric copolymer derived from at least one cationic monomer comprising an ethylenic unsaturation, and at least one anionic monomer comprising an ethylenic unsaturation, optionally in a mixture with at least one nonionic monomer.

The weight of titanium dioxide nanoparticles is 0.01 to 15% (100 ~ 150,000 ppm).

The purpose of Aubay reference is cleaning or disinfecting of hard surfaces encountered in the food industry, kitchens, bathrooms, washrooms, hospitals, glazing, facades, etc, and reducing cleaning times. On the other hand the purpose of claim 2 of the present application is promoting plant growth by increasing the photosynthetic efficiency.

Although titanium dioxide nanoparticles and other common ingredients are used for the present invention and Aubay reference, the compositions must be compared as a whole not by individual ingredients.

The composition of Aubay reference includes titanium dioxide particles whose size is less than 100 nm, water or at least one alcohol whose boiling point is less than 120.degree. C., and at least one film-forming organic or organosiloxane polymer.

On the other hand, the composition of claim 2 includes titanium dioxide nanoparticles of 3 to 200 nm; silver nanoparticles of 1 to 100 nm; and adjuvants one or more selected from a water soluble salt, metallic oxide, non-metallic oxide, which are used at the amount of 0.1 to 20% by weight relative to the titanium dioxide solids; and a

surfactant for dispersion one or more selected from a cationic surfactant, a nonionic surfactant, an anionic surfactant, an amphoteric surfactant, which are used at the amount of 0.1 to 5% by weight relative to the titanium dioxide solids.

Aubay reference uses titanium dioxide nanoparticles for preventing pollution and disinfection, which are typical functions of photocatalyst. For this purpose effective adhesion of titanium dioxide dispersion is required, which is not accomplished by the titanium dioxide dispersion itself, and thus organic polymer or organosiloxane polymer is added.

Therefore, the composition of the present invention is completely different from the composition of Aubay reference.

The disinfection effect of Aubay reference is achieved by adhering titanium dioxide film forming dispersion to the surface of an object and by exposing the surface to sunlight. On the other hand, the effect of increasing photosynthetic efficiency by the present invention is achieved by only one application of the composition to a leaf surface. Such effect cannot be achieved by applying the composition of Aubay reference to a leaf surface. Deriving the composition of the present invention from Aubay reference is not easy, either.

Claims 4, 7, 8, and 10-12 depend on claim 2, and thus are not anticipated by Aubay reference.

III. Claim 9 was rewritten per the Examiner's guidance.

Claim 9 is as follows:

'A liquid composition for promoting plant growth by increasing the photosynthetic efficiency, which contains titanium dioxide nanoparticles having a particle size of 3 to 200 nm; and silver nanoparticles having a particle size of 1 to 100 nm, which are used at the amount of 0.5 to 20% by weight relative to the titanium dioxide solids; and adjuvants one or more selected from a water soluble salt, metallic oxide,

non-metallic oxide, which are used at the amount of 0.1 to 20% by weight relative to the titanium dioxide solids; and a surfactant for dispersion one or more selected from a cationic surfactant, a nonionic surfactant, an anionic surfactant, an amphoteric surfactant, which are used at the amount of 0.1 to 5% by weight relative to the titanium dioxide solids.'

IV. Claim 11 is amended to read as follows:

'The composition of Claim 2, in which the aqueous solution is diluted with water such that a titanium dioxide concentration is in the range of 1 to 1,000 ppm *for greater effect on crop yield*, when applied to the foliage of crops.'

The concentration of the composition of Aubay reference is 100~150,000 ppm (0.01~15%). The concentration of the composition of present invention is 1~1,000 ppm. While the ranges overlap partially, the range of Aubay reference is intended for the film-forming organic polymer to interact with the surface of the titanium dioxide particles by electrostatic bonding. On the other hand, the range of the present invention is intended for promoting plant growth by increasing the photosynthetic efficiency.

V. The added claim 12 reads as follows:

'The composition of Claim 2, in which aqueous solution is maintained a stable colloidal form by adjusting a pH with organic or inorganic acid for absorbing to plant.'

Aubay reference adjusts pH from 4 to 9 of the composition with mineral acids or organic acids for promoting solubility of the additive, stability, wettability, augmenting its film-forming nature, its biocidal nature, or providing other supplementary properties. On the other hand, the present invention adjusts pH with organic or inorganic acid for maintaining the solution in a stable colloidal form. As explained in paragraph 0041 [paragraph number from US Patent Publication No. 20050079977] of the specification, when titanium dioxide is diluted with water, as the dilution ratio increases, titanium

dioxide tends to precipitate as the isoelectric point of about pH 4 is approached, the present invention adjusts pH so that it maintains stable colloidal form even though it is diluted by tens of thousands times. In embodiment 1, pH of the composition of the present invention is adjusted at 0.5.

CONCLUSION

The applicant believes that the rejections were obviated by the amendment of claims and the above remarks, and the application is now in condition for allowance: therefore, reexamination, reconsideration and allowance of the claims are respectively requested. If there are any additional comments or requirements from the examination, the applicant asks for a non-final office action.

The Commissioner is hereby authorized to charge payment of any additional fees associated with this communication, or credit any over-payment to Deposit Account No. 16-0310.

Very truly yours,

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